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SEPARATION OF A MIXTURE OF THE SIMPLEST HYDROCARBONS BY THE CHROMATHERMOGRAPHIC METHOD

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The separation of a mixture of ethane, ethylene, propane, propene, and alpha-butene was investigated using the chromatnermographic method which had been proposed earlier by A. A Zhukhovitskiy. On the basis of preliminary experiments in which the optimal conditions for the separation of the components of this mixture had been determined, a ring-shaped electrical heater equipped with five independently regulated nichrome windings placed side by side was constructed. This heater, which was 25 cm long, provided a temperature distribution in steps which were appropriately scaled down along the axis of the heater. It has been shown that the temperature at which a component of the mixture leaves the chromathermographic column depends on the ratio η of the velocity of the motion of the heater (V in cm/min) to the velocity of the gas (α in cm3/min). To separete the mixture with the aid of a column 15 cm long, having a diameter of 2 cm, and filled with silica gel, air is blown in and the heater is slowly moved along the column by means of a synchronous motor. After leaving the column, the gas enters the cuvette of an interferometer for analysis. The conditions under which there is complete separation of the components of the mixture at η = 0.028 were found. Under these conditions, a distinct peak on the composition-time curve corresponds to every component, and the least distance between the peaks (those corresponding to ethane and ethylene) is 3 min on the axis of abcissae. The existence of the linear dependence which is expressed by the equation $\ln \eta = Q/RT - C$ and required by the theory was confirmed. In this equation, Q is the heat of adsorption of the component, R the universal gas constant, T the temperature at which the component leaves the column, and C a constant. The heat of adsorption Q can be determined with the aid of this equation.

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